

Science 10 Population Density Calculations

D = population density

S = space

N = number of individuals or population

Formulas

$$D = N/S$$

$$N = D \times S$$

$$S = N/D$$

Example 1 (find the density)

A biologist counted 36 crows in a 5 km² forest. Find the density of crows in the forest.

$$D = N/S \quad D = 7.20 \text{ crows/km}^2$$

Example 2 (find the number or population)

In 10 sample areas within a marsh, the density of frogs was found to be 0.45 frogs per m². How many frogs would you expect to find in the entire 245 m² marsh?

$$N = D \times S \quad N = 110.25 \text{ frogs}$$

Example 3 (find the space)

Given a density of 2.2 grasshoppers per m² how large an area would you have to net in order to capture 500 grasshoppers?

$$S = N/D \quad S = 227.27 \text{ m}^2$$

Example 4

A biologist counted 33 squirrels in a 7 km² section of a forest. Find the density of squirrels in that section of the forest.

$$D = N/S \quad D = 4.71 \text{ squirrels/km}^2$$

How many squirrels would you expect to find in the entire 387 km² forest?

$$N = D \times S \quad N = 1824.43 \text{ squirrels}$$

Population Density Calculations Review Sheet

For each question write the formula, substitute the values, and state the answer including units.

1. a) 165 grasshoppers were counted in a 6 m² test plot. Find the density of grasshoppers? $D = 27.50 \text{ grasshoppers/m}^2$

- b) Predict the population of grasshoppers in an entire field measuring 800 m². $N = 22000.00$

2. a) 172 grasshoppers were counted in five 1 m² test plots. Find the density of grasshoppers? $D = 34.4 \text{ grasshoppers/m}^2$

(500 x 500)
m²

- b) Predict the population of grasshoppers in an entire field measuring 500 m by 500 m. $N = 8,600,000.00$ grasshoppers
3. a) 487 grasshoppers were counted in a 10 m by 10 m test plot. Find the density of grasshoppers? $D = 4.87$ grasshoppers / m²
b) Predict the population of grasshoppers in 1 km² field. $487,000.00$ grasshoppers
4. In a garden that measures 12 m² there are 19 chickweed plants. Find the density of chickweed in the garden. 1.58 chickweed / m²
5. In a bush that measures 250 m² there are exactly 104 juniper shrubs. Find the density of the junipers. 0.42 junipers / m²
6. a) A marine biologist estimated 95 elodea plants in a 5 m³ test area of a 12455 m³ fresh water lake. What is the density of the elodea in the test area? 19.00 elodea / m³
b) Calculate the population of elodea in the entire lake. $236,645.00$ elodea
7. Eagles can have a wingspan of up 1.5 m and yet can soar while emitting almost no sound. 21 eagle nests were spotted in a 156 km² nature preserve. Assuming 1 pair of breeding birds per nest, what is the density of breeding eagles in the nature preserve? 0.27 eagles / km²
8. a) During the month of September 2005 in a small forest 680 fresh squirrel caches were found in an area measuring 0.75 km by 0.5 km. On average a single squirrel creates 38 caches in a year. Find the density of squirrels in the area. $68,106.67$ squirrels / km²
b) How many squirrels would you expect to find in a similar forest measuring 264 km²? $18,191,310.00$ squirrels
9. In a rain forest 12 spiders were counted in a test plot measuring 5m by 5m. Estimate the population of spiders in a 565 m² rain forest? 271.20 spiders
10. The density of frogs in a 1020 m³ pond was calculated to be 0.4 frogs/m³. Calculate the population of frogs in the pond. 408.00 frogs
11. a) Calculate the area of pasture required to support 550 cattle if the carrying capacity of grazing land is 9.7 cows per acre. 56.70 acres
b) How much pasture would be needed to support 12000 head of cattle on similar pasture? 1237.11 acres
12. The density of rattlesnakes in an area was found to be 41 snakes/km². How large an area would you have to cover to encounter 100 snakes? 2.44 km²
13. How many eagles would you expect to find in a 4 km by 5 km area if the eagle density was 0.75 eagles/km²? 15 eagles
14. According to trapping records an estimated 157 beavers occupy an area measuring 47 km by 72 km. Assuming similar habitat what is the estimated beaver population in a 50 000 km² area? 2319.74 beavers
15. In a 0.5 km² test area of a forest 258 owl pellets were found in 2005. Assuming each owl produces 52 pellets per year; estimate the owl population in the entire 220 km² forest in 2005.

2183.08 owls